

*ELEDONE PALARI*, A NEW SPECIES OF OCTOPUS  
(CEPHALOPODA: OCTOPODIDAE) FROM AUSTRALIA

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ABSTRACT

A new species of octopus, *Eledone palari* (Cephalopoda: Octopodidae), is described and illustrated from Australian waters. It is the first record of the genus outside the Atlantic Ocean. The species can be easily distinguished from other congeners by characters that include: a broadly ovoid, dorso-ventrally compressed mantle, with a distinctive pattern of papillae on the dorsum, and a prominent ventro-lateral integumentary ridge or fold; short arms, with tips of non-hectocotyliised arms of males modified into thickened spongy pads; a medium-sized ligula (5-9% of third right arm length in mature animals) and a large differentiated calamus; very large eggs (14-16 mm long); and five gill lamellae. The species lives on sand or mud bottom in offshore waters, in depths from 110-620 m. The animal is medium-sized: males mature at approximately 30 mm mantle length and females attain ovarian maturity at a mantle length of about 60 mm. The morphology of the calamus on the hectocotylus, and its implication for the definition of the genus *Eledone*, is discussed.

During a survey of cephalopod resources in southern Queensland waters in 1980, several specimens of an eledonid octopod were discovered. Additional material has since been found in Australian museum collections, and subsequent collecting cruises. This taxon was referred to as *Eledone* sp. in a checklist of Australian Cephalopoda by Lu and Phillips (1985). After further study, the specimens proved to be a new and unusual species of *Eledone*.

The counts, measurements and indices are defined by Roper and Voss (1983). Other abbreviations used are: ML—mantle length and TL—total length. Measurements for all specimens are on file in the Department of Invertebrate Zoology, Museum of Victoria. Material is lodged in the collections of: The Australian Museum, Sydney (AM); Museum of Victoria, Melbourne (NMV); Queensland Museum, Brisbane (QM); South Australian Museum, Adelaide (SAM); Western Australian Museum, Perth (WAM).

Octopodidae

*Eledone* Leach, 1817

*Type Species*.—*Octopus moschatus* Lamarck, 1798.

*Diagnosis*.—Benthic octopodids. Mantle saccular, without fins. Eight arms lacking cirri, arms with uniserial suckers, arm tips of males modified, third right arm of males hectocotyliised with end of arm modified into ligula with or without calamus. Web well developed. Ink sac present. Crop diverticulum well developed. Radula normal with multicuspid rhachidian, lateral teeth and marginal plates well defined. Stylets cartilaginous and vestigial.

*Eledone palari* new species

Figures 1-6

*Material Examined*.—See Appendix Table 1. Other material studied is included in Appendix Table 2.

*Diagnosis*.—Eledonid octopods with dorso-ventrally compressed mantle; long and very prominent ventro-lateral ridge around mantle circumference; males with

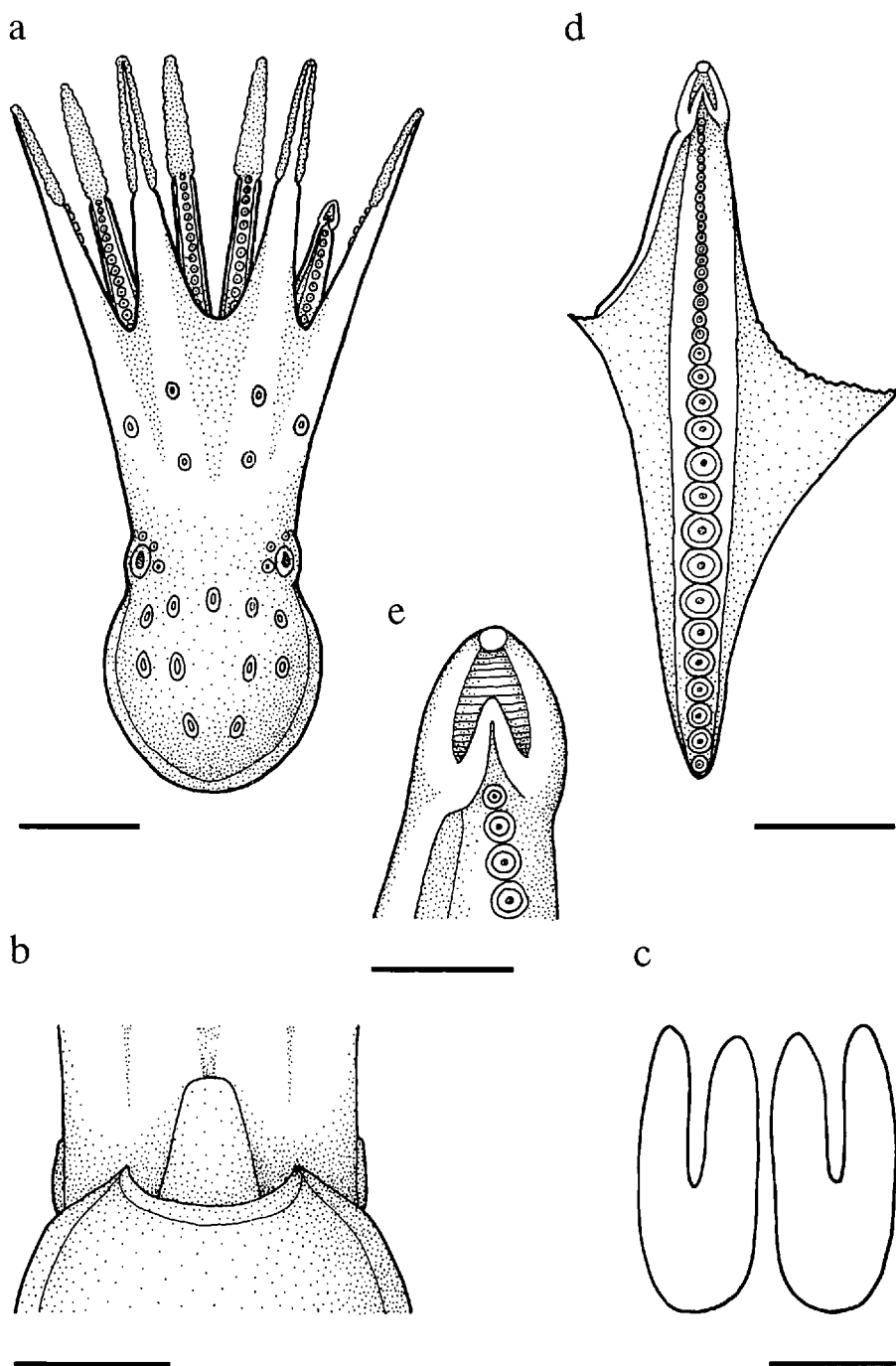


Figure 1. *Eledone palari*, n. sp.: a, dorsal view of holotype, NMV F57849, M, 38.3 mm ML (scale bar = 20 mm); b, ventral view of mantle opening and funnel of paratype, NMV F57531, F, 39.9 mm ML (scale bar = 10 mm); c, funnel organ of paratype, NMV F57531, M, 37.6 mm ML (scale bar = 4 mm); d, hectocotylised arm of paratype, NMV F57531, 37.0 mm ML (scale bar = 10 mm); e, detail of hectocotylus of paratype, NMV F57531, 38.7 mm ML (scale bar = 4 mm).

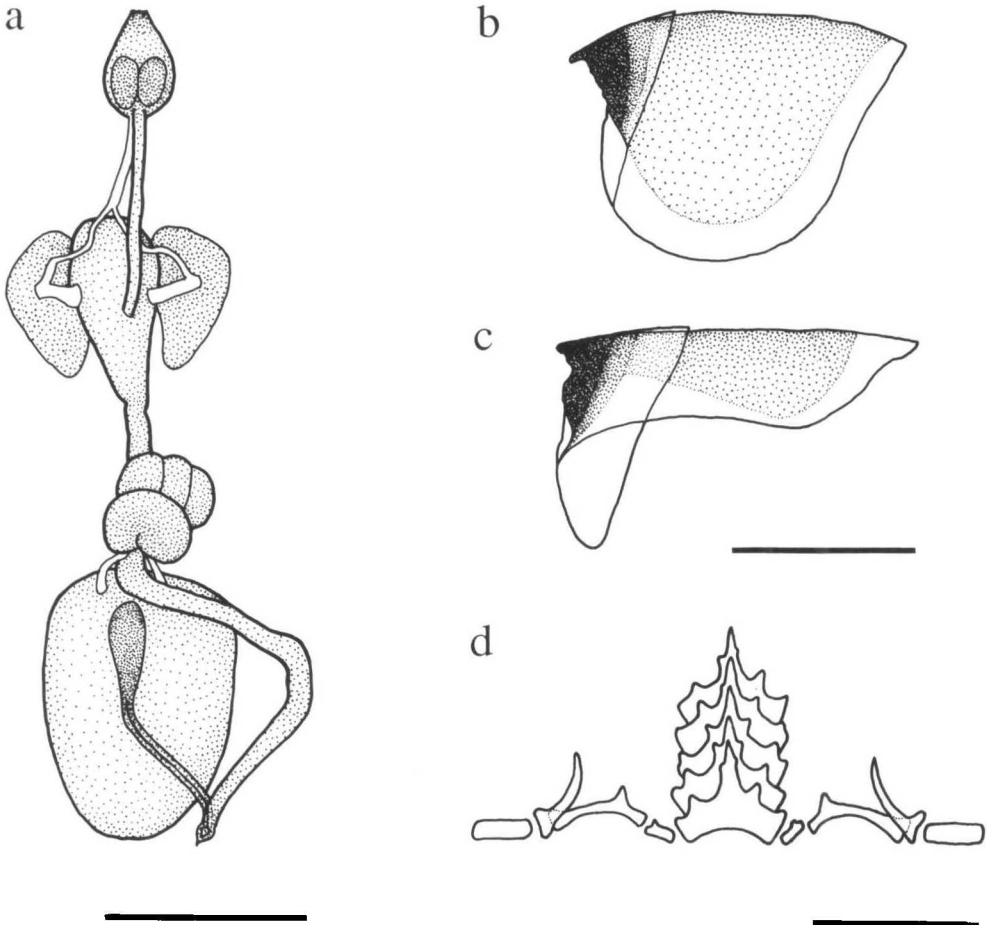


Figure 2. *Eledone palari*, n. sp.: a, digestive tract of NMV F57541, F, 58.0 mm ML (scale bar = 20 mm); b, upper beak, and c, lower beak, of paratype, NMV F57537, F, 54.2 mm ML (scale bar = 3 mm); d, radula of paratype, NMV F57850, F, 60.5 mm ML (scale bar = 0.5 mm).

hectocotylus differentiated into ligula and calamus; males with tips of non-hectocotylised arms modified into thickened spongy pads.

**Description.**—Counts, measurements and indices listed in Tables 1–4. Medium-sized animals with firm consistency (Figs. 1a, 5). Mantle saccular, broadly ovoid, dorso-ventrally compressed (MWI 66.9–84.9–99.3); mantle wall moderately thin, muscular. Head wide, but narrower than mantle (HWI 51.2–65.2–75.1); demarked from mantle by moderate constriction. Eyes large, not projecting above surface of head. Funnel large, slender, bluntly tapered (FuLI 29.8–40.8–56.8); free for about one-quarter of its length (Fig. 1b; FFuI 15.8–24.2–34.3). Funnel organ consisting of two V-shaped units; limbs thick; outer limbs as long as median limbs (Fig. 1c). Mantle aperture very wide (PAI 91.5–112.5–150.7).

Brachial crown strong, well developed. Arms short (MAI 43.3–59.1–73.6) (1.2–2.3 times mantle length in mature animals); slender (AWI 4.4–7.4–9.9); tapering to fine tips in females; tapering to modified blunt tips in males. Modified arm tips in males consist of thickened spongy tissue comprising 2–43% of total arm length. Arm lengths subequal; arm order usually I.II.III.IV. Suckers uniserial, without obvious radial grooves; small (ASIn 4.6–5.8–7.1); all suckers similarly sized, without enlargement in either sex.

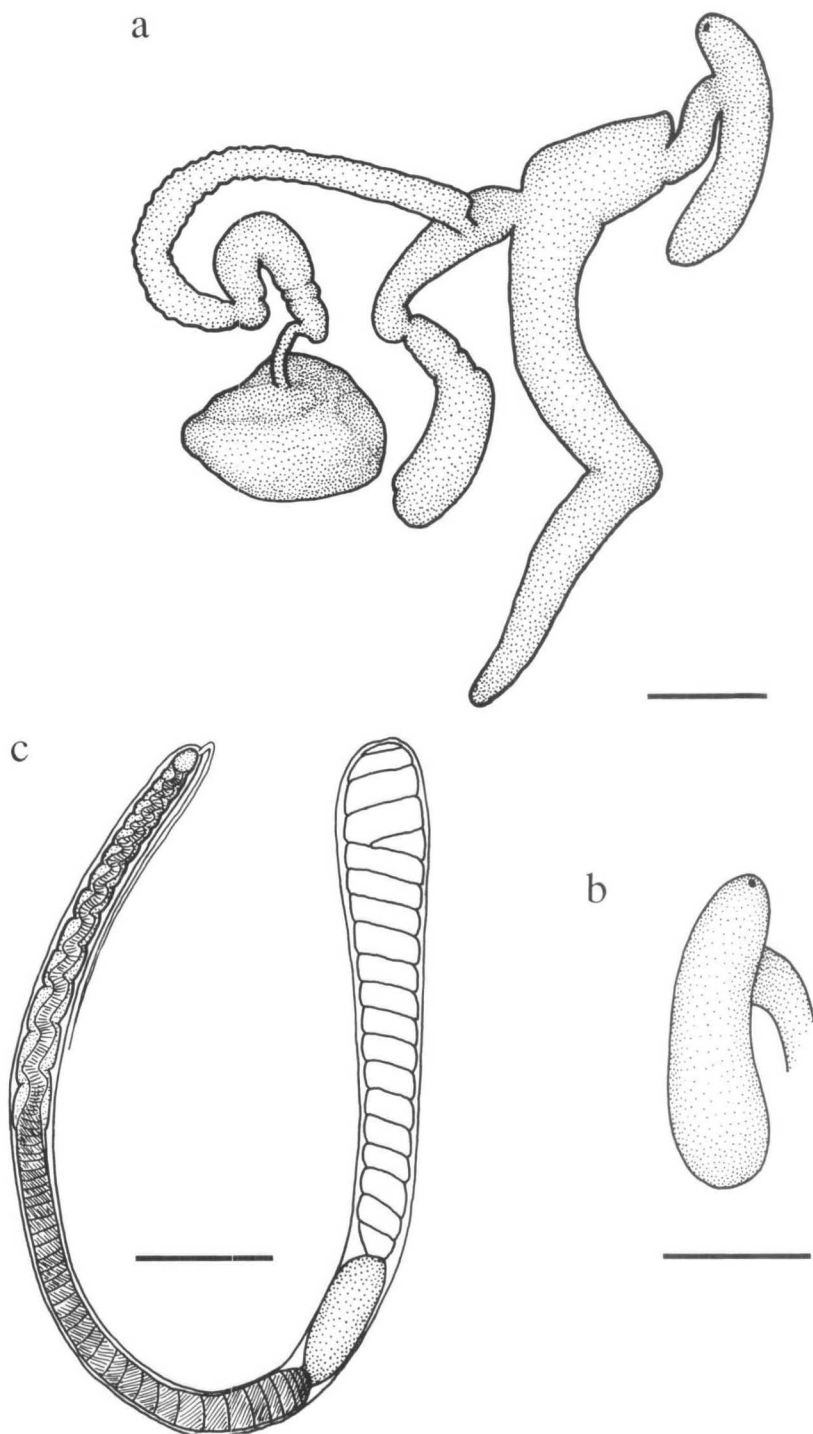


Figure 3. *Eledone palari*, n. sp.: a, male reproductive organs of paratype, NMV F57531, 37.0 mm ML (scale bar = 5 mm); b, penis of paratype, NMV F57536, 37.9 mm ML (scale bar = 4 mm); c, spermatophore of paratype, NMV F57531, 38.3 mm ML (scale bar = 2 mm).

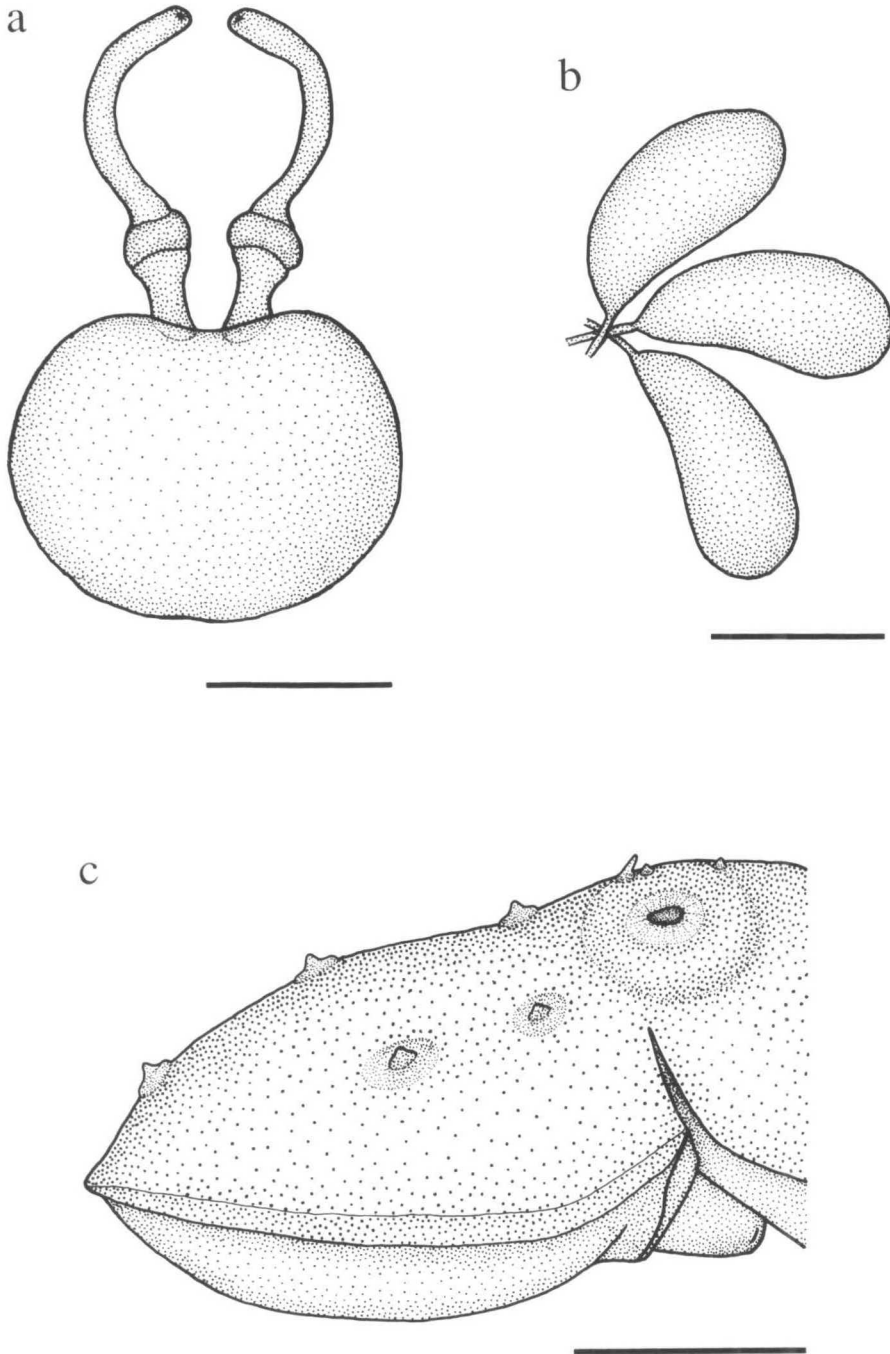


Figure 4. *Eledone palari*, n. sp.: a, female reproductive organs of paratype, NMV F57850, 60.5 mm ML (scale bar = 20 mm); b, mature laid eggs, NMV F57828 (scale bar = 10 mm); c, lateral view of mantle and head of paratype, F, NMV F57531, 46.5 mm ML (scale bar = 20 mm).

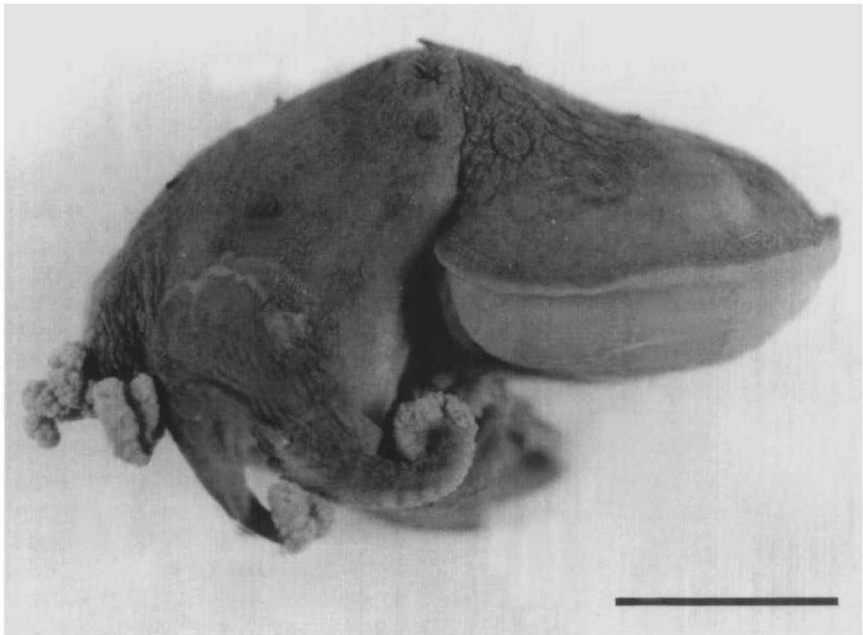


Figure 5. *Eledone palari*, n. sp.: Lateral view of holotype, NMV F57849, M, 38.3 mm ML, from off North Stradbroke Island, Queensland (scale bar = 20 mm).

Table 1. Measurements (mm) and indices of 10 female *Eledone palari* n. sp.

Reg.	NMV F57531		NMV F57531		NMV F57531		NMV F57531		AM C71026	
ML	32.6		39.2		39.9		46.5		49.3	
TL	81.4		106.7		100.7		119.7		118.7	
MWI	71.2		91.6		86.5		82.4		79.9	
HWI	64.7		70.9		66.4		60.9		66.5	
MAI	69.5		61.3		67.3		65.8		73.6	
ALI	L	R	L	R	L	R	L	R	L	R
I	143.9	138.3	155.1	163.3	147.1	138.3	131.8	144.1	116.6	135.9
II	140.5	135.0	151.0	156.4	139.8	147.9	143.2	148.6	131.0	129.8
III	131.0	128.8	149.7	147.7	138.6	141.4	143.0	152.0	130.2	134.1
IV	123.6	134.7	148.7	149.7	133.3	148.6	130.8	139.4	133.5	126.6
AWI	7.7		7.1		7.0		7.5		6.5	
ASIn	5.8-6.4		6.4-7.1		5.3-6.0		5.8-6.2		5.9-6.5	
WDI	49.7		52.2		56.5		57.3		55.4	
WF	ABCDE		ABCDE		ABCDE		ABCDE		ABCDE	
GiLC	5	5	5	5	5	5	5	5	5	5
EgLI	3.6-4.3		8.4-8.9		6.5-7.8		15.5-17.0		8.9-12.0	
EgWI	1.2-1.4		2.3-2.6		1.8-2.3		4.5-5.6		2.0-2.4	
FuLI	42.6		43.9		42.9		40.6		37.5	
FFuI	24.5		22.4		27.8		22.2		27.8	
PAI	113.8		109.7		105.5		102.6		91.5	

\* With mature ovary.

Web formula usually ABCDE; ventral sector always shallowest. Web deep (WDI 38.1–52.0–66.7); web remnants extend up ventral side of arms for approximately five-sixths of their length. Third right arm of males hectocotylied (Fig. 1d, e); shorter than its opposite number (OAI 68.6–79.3–98.3; HcAI 106.8–130.5–154.0). Hectocotylied arm with 31–50 suckers.

Spermatophoral groove poorly developed, without conspicuous thickening of web membrane. Ligula 5–9% of hectocotylied arm length in mature animals (LLI 5.0–7.2–8.8). Ligula groove short, indistinctly marked and shallow, with approximately 10 poorly defined transverse ridges. Calamus well formed, very long, acutely pointed (CaLI 50.0–63.3–74.1).

Gills with five lamellae on outer demibranch, plus the terminal lamella.

Digestive tract typical of the genus (Fig. 2a). Upper beak has short, blunt, curved rostrum; curved crest; large wings; large lateral walls, with posterior margin slightly indented (Fig. 2b). Lower beak has short, blunt rostrum; long hood; long, straight crest; large lateral walls; small wings (Fig. 2c). Rostrum, hood, crest, and lateral walls, of both upper and lower beaks, lightly pigmented, light to dark brown in color; margins of wings, hood, crest and lateral walls of both beaks transparent. Radula typically octopodan (Fig. 2d), with seven transverse rows of teeth. Rha-chidian tooth has asymmetrical seriation of B<sub>3.5</sub> type, and is slender, with two small lateral cusps on either side. First lateral teeth small and unicuspidate; second lateral teeth large with long curved base; third lateral teeth long and curved; marginal plates oblong and plain.

Anterior salivary glands small, bordering posterior buccal mass. Posterior salivary glands stout anteriorly, tapering posteriorly. Salivary ducts typical. Crop with anterior diverticulum of about 50% of its length. Posterior oesophagus short. Stomach typically bipartite. Caecum with a single loose coil. Two separate ducts connect digestive gland with caecum. Intestine short, undifferentiated. Ink sac

Table 1. Continued

NMV F57531		AM C131853		NMV F57537		NMV F57536		AM C89587	
50.1		53.4		54.2		60.5		76.2	
124.7		135.1		146.0		164.9		181.8	
95.0		73.4		76.2		97.0		93.4	
95.0		73.4		62.5		62.5		59.1	
69.7		62.1		59.0		62.2		69.7	
L	R	L	R	L	R	L	R	L	R
137.7	142.1	152.6	146.8	167.7	166.1	160.7	155.9	124.8	127.6
140.5	143.5	161.0	158.2	168.5	168.8	154.5	160.3	127.7	132.8
138.7	140.7	149.4	153.9	169.6	159.0	153.4	160.7	131.8	143.6
135.5	131.9	139.3	143.8	160.5	158.9	151.7	150.6	134.3	138.2
7.8		6.6		7.2		8.1		7.1	
5.4–5.8		4.9–5.4		4.6–5.0		5.3–5.8		5.0–5.4	
55.1		56.0		55.4		56.0		57.3	
ABCDE		BA=CDE		BACDE		ABCDE		CBADE	
5	5	5	5	5	5	5	5	5	5
22.0–23.8		3.6–3.7		4.4–5.5		22.6–26.4*		21.3–21.7*	
7.2–8.0		0.7		0.9–1.1		6.0–7.1*		6.2–6.7*	
43.5		40.1		36.3		49.3		29.8	
28.1		27.7		20.7		27.1		23.2	
118.6		103.2		104.6		117.5		111.3	

Table 2. Measurements (mm) and indices of 10 male *Eledone palari* n. sp.

Reg.	NMV F57532		AM C131854		NMV F57531		NMV F57531		NMV F57531	
ML	20.5		30.8		32.1		34.4		37.0	
TL	60.7		78.1		90.2		109.3		113.7	
MWI	95.6		82.1		91.6		91.0		82.4	
HWI	75.1		71.1		74.1		74.4		65.1	
MAI	58.2		72.6		58.8		49.9		48.6	
ALI	L	R	L	R	L	R	L	R	L	R
I	170.2	165.4	133.4	137.7	155.1	170.1	189.5	194.5	205.1	203.0
II	171.7	164.9	127.6	131.5	167.6	152.6	200.6	185.2	205.9	153.5
III	155.1	133.7	126.0	121.8	165.4	129.9	185.5	134.6	86.8*	137.8
IV	160.5	171.2	117.5	103.6	154.8	154.2	168.9	181.1	140.0	169.7
AWI	9.3		7.5		8.1		7.3		7.0	
ASIn	6.3		5.8-6.2		6.5-6.9		6.7-7.0		5.7-5.9	
WDI	52.0		59.2		51.5		39.9		38.2	
WF	ABCDE		BA=CDE		ABCDE		ABCDE		ABCDE	
GiLC	5	5	5	5	5	5	5	5	5	5
HcAI	133.7		121.8		129.9		134.6		137.8	
OAI	86.2		96.6		78.5		72.6		—	
LLI	3.6		5.6		7.4		7.3		7.6	
CaLI	60.0		61.9		67.7		58.8		59.0	
HASC	31		46		37		38		36	
PLI	16.1		11.7		25.2		26.2		32.2	
SpLI	—		—		54.5		67.4		64.3-85.9	
SpWI	—		—		6.9		5.6		3.8-4.6	
SpRI	—		—		37.7		42.7		45.0-47.6	
FuLI	48.8		34.7		38.0		40.1		43.5	
FFuI	24.9		23.4		24.6		22.7		25.1	
PAI	150.7		98.1		115.3		109.3		140.0	

\* Arm severed.

large, lying embedded on ventral face of digestive gland. A long, slender duct connects ink sac with dorsal side of intestine near anus. Anus lacking anal flaps.

Testis posterior in position. Vas deferens very short, stout, not coiled, entering spermatophoral gland at proximal end. Spermatophoral gland swollen proximally, with muscular walls, but becoming thin walled towards its junction with the short accessory gland. A short tube connects accessory gland and Needham's sac. Needham's sac very long, conical, pointed at apex. Penis long (PLI 10.7-22.3-32.2), with a single straight diverticulum. Genital aperture terminal (Figs. 3a, b).

Spermatophores relatively long (SpLI 45.6-61.6-85.9) and slender (SpWI 3.4-5.5-9.1) (Fig. 3c). Oral cap simple, not markedly expanded, with a long cap thread. Ejaculatory apparatus is a tightly coiled tube, which narrows orally, with about 15 coils at the oral end. Thick, bulbous cement body connects with both oral and aboral ends by narrow necks. Sperm reservoir spirally wound with a rounded aboral end; comprises approximately half of the spermatophore length (SpRI 27.7-41.3-48.5); forms widest region of spermatophore.

Ovary large, ovoid, displacing adjacent organs when mature (Fig. 4a). Proximal oviducts short, straight, attaching to spherical oviductal glands, which have one hemisphere darker in color. Distal oviducts sharply curved, tapering gradually. Mature eggs (NMV F57828) very large (14-16 mm long; 4-7 mm wide), white, translucent (Fig. 4b; EgLI 17.3-21.7-26.5; EgWI 4.6-6.0-7.1). Eggs attached by long, twisted egg stalks; forming festoons.



Table 2. Continued

NMV F57536		AM C131854		NMV F57849		NMV F57531		NMV F57531	
37.9		38.1		38.3		38.7		39.6	
107.8		104.3		122.4		115.9		113.3	
85.2		66.9		90.1		92.5		79.8	
72.0		61.4		73.1		66.9		68.7	
51.4		58.0		47.9		51.4		56.8	
L	R	L	R	L	R	L	R	L	R
168.3	186.0	164.6	159.6	183.8	183.2	194.6	171.3	176.0	174.0
192.3	182.3	172.4	146.5	160.3	208.6	184.5	182.9	164.4	175.3
194.7	142.2	159.8	126.2	182.5	133.2	170.5	128.7	169.9	119.2
172.3	184.2	143.8	145.4	186.4	182.8	161.8	192.2	153.0	171.7
7.7		7.1		7.0		8.3		6.8	
6.1–6.6		5.8–6.3		6.0–6.3		5.7–6.2		5.3–5.8	
50.5		51.6		38.1		41.0		42.9	
BCADE		ABCDE		ABCDE		BACDE		ABCDE	
5	5	5	5	5	5	5	5	5	5
142.2		126.2		133.2		128.7		119.2	
73.0		79.0		73.0		75.5		70.1	
5.0		6.0		8.2		8.6		7.0	
74.1		65.5		52.4		58.1		72.7	
36		50		36		37		34	
21.6		17.6		26.1		26.9		31.1	
52.2–63.9		48.6		61.9–74.9		58.4–76.7		49.7–74.0	
4.5		5.9		4.5–6.3		5.1–5.5		3.4–4.6	
37.4–42.1		36.2		39.0–44.9		39.4–46.5		39.1–48.5	
41.4		38.3		38.4		39.5		39.9	
15.8		21.0		23.8		21.2		24.7	
112.9		101.3		113.6		115.0		107.3	

Integumental sculpture consists of a pattern of fine, rounded and closely set epidermal tubercles. The tubercles cover the dorsal surface. Unbranched papillae present on dorsum. Pattern of papillae on mantle includes approximately four sub-parallel rows of simple, unbranched papillae along the mantle length. Each row has 2–3 papillae. A large, unbranched papilla is present in the supraocular region, surrounded by 2–3 smaller, unbranched papillae. Ventro-lateral integumentary ridge or fold around mantle circumference large and prominent (Figs. 1a, 4c, 5).

In life, color of resting animals is cream to light brown mottled dorsally, slightly paler ventrally; when stimulated, animals become darker, turning dark brown-green to dark green. Preserved specimens in isopropyl alcohol uniformly light brown to red brown dorsally, and cream to light brown ventrally. Surface of raised tubercles and papillae usually darker than the background, giving a reticulate pattern. Ocelli absent.

Males mature at approximately 30 mm mantle length. Females attain ovarian maturity at about 60 mm mantle length. The largest specimen studied was a female of 80 mm mantle length from off the North West Shelf, W.A. (NMV F57533).

*Holotype*.—Male, 38.3 mm ML, NMV F57849; fixed in formalin and preserved in isopropyl alcohol.

*Type Locality*.—AUSTRALIA, Queensland, East of North Stradbroke Island [27°35'S, 153°50'E], 157 m.

Table 3. Combined ranges, means and standard deviations of indices of 21 male and 30 female *Eledone palari* n. sp.

Index	Range and mean	SD (n - 1)
MWI	66.9-84.9-99.3	8.2
HWI	51.2-65.2-75.1	6.0
MAI	43.3-59.1-73.6	7.8
Male ALI		
I	126.1-170.8-231.0	22.8
II	125.8-168.8-226.8	21.2
III	126.0-165.4-202.0	19.9
IV	103.6-159.3-210.2	21.0
Female ALI		
I	116.6-159.8-203.7	21.0
II	125.7-158.3-217.3	20.2
III	121.1-154.8-194.8	18.3
IV	117.1-151.9-189.3	17.4
AWI	4.4-7.4-9.8	1.1
ASI	4.6-5.8-7.1	0.5
WDI	38.1-52.0-66.7	6.5
HcAI	106.8-130.5-154.0	11.1
OAI	68.6-79.3-98.3	9.0
LLI	5.0-7.2-8.8	1.0
CaLI	50.0-63.3-74.1	7.2
PLI	10.7-22.3-32.2	6.6
SpLI	45.6-61.6-85.9	11.1
SpWI	3.4-5.5-9.1	1.3
SpRI	27.7-41.3-48.5	5.1
EgLI	17.3-21.7-26.5	2.6
EgWI	4.6-6.0-7.1	0.9
FuLI	29.8-40.8-56.8	4.3
FFuI	15.8-24.2-34.3	3.4
PAI	91.5-112.5-150.7	13.9

**Distribution.**—North-western Australia from off Darwin, N.T. (~10°S) to off Dampier, W.A. (~19°S). North-eastern Australia from off Cape York, Queensland (~11°S) to off Sydney, N.S.W. (~34°S). Southern Australia from off Eucla, W.A. to the central Great Australian Bight (~33°S) (Fig. 6). Bathymetric records range from 110–620 m. The species is common in offshore waters, living on sand and mud bottom.

**Etymology.**—The specific name *palari* is derived from an Australian Aboriginal word meaning “different,” and is to be treated as indeclinable. This refers to the marked differences between this species and its congeners.

**Discussion.**—In addition to *Eledone palari*, the genus *Eledone* comprises seven other species: *E. moschata* (Lamarck, 1798); *E. cirrhosa* (Lamarck, 1798); *E. nigra* (Hoyle, 1910); *E. caparti* Adam, 1950; *E. thysanophora* Voss, 1962; *E. massyae* Voss, 1964; and *E. gaucha* Haimovici, 1988. *E. palari* differs from all other *Eledone* species with its very prominent, ventro-lateral, peripheral fold which appears in preserved specimens as a sharp edged ridge around the periphery of the mantle, which divides the mantle into well defined dorsal and ventral surfaces. The strong contrast in coloration between the two mantle surfaces, with the dark dorsum and very pale ventrum, is also unique among *Eledone* species. Obser-

Table 4. Modification of arm tip, as percentage of total arm length, in 21 males of *Eledone palari* n. sp.

Reg. No.	ML (mm)	ALI	ARI	ALII	ARII	ALIII	ARIII*	ALIV	ARIV
NMV F57532	20.5	25.2	22.1	28.1	17.8	25.2	—	13.7	21.4
NMV F57542	30.0	4.3	5.0	3.3	4.6	4.0	—	2.9	4.0
AM C131854	30.8	5.8	8.3	5.3	3.2	8.5	—	7.2	4.1
NMV F57531	32.1	16.3	24.7	21.4	16.1	22.0	—	18.3	22.2
NMV F57535	32.8	6.3	5.0	5.4	5.3	2.3	—	6.8	5.0
WAM 12-90	34.0	28.3	28.6	23.7	15.5	27.5	—	23.0	23.1
AM C71017	34.4	23.0	23.8	22.8	22.1	28.6	—	26.6	26.0
NMV F57531	34.4	27.8	29.7	29.9	26.7	30.6	—	24.3	30.5
NMV F57531	36.6	20.5	12.2	26.0	24.1	30.7	—	31.3	30.2
NMV F57531	37.0	43.5	40.5	39.8	34.5	—†	—	17.8	39.3
AM C131860	37.4	13.6	8.6	17.1	13.8	17.6	—	16.4	15.7
NMV F57531	37.6	22.1	27.4	27.3	28.3	33.2	—	27.6	33.8
NMV F57536	37.9	9.4	16.9	20.9	18.2	23.2	—	13.8	12.8
AM C131854	38.1	18.3	15.6	13.1	12.4	13.3	—	11.9	10.1
NMV F57849	38.3	32.1	28.9	23.3	35.0	31.5	—	35.9	32.9
NMV F57531	38.7	30.9	28.5	31.8	32.9	27.7	—	29.4	35.5
AM C131854	39.0	17.3	9.1	16.4	12.5	—†	—	9.7	16.3
NMV F57531	39.6	29.6	31.8	31.8	32.6	33.4	—	32.3	36.8
AM C140398	39.6	20.8	18.7	16.0	9.5	18.7	—	15.4	20.4
AM C140401	39.9	7.0	7.8	2.6	12.4	8.4	—	11.8	11.1
NMV F57529	49.0	28.8	32.3	22.2	30.3	31.6	—	32.8	36.9
Mean		20.5	20.3	20.4	19.4	22.0	—	19.5	22.3

\* Hectocotyliised arm; ligula and calamus as modified tip.

† Arm severed.

vations made on board research vessels revealed that the peripheral ridge and the strong contrast of coloration between dorsal and ventral mantle surfaces were not evident in newly trawled specimens; they only became obvious after the specimens were fixed in formalin. No other species of *Eledone* possess such a pronounced peripheral ridge or such coloration.

All *Eledone* species exhibit sexual dimorphism of the arms: the distal portions of all non-hectocotyliised arms in males are modified. The nature of the modification is specific. In all *Eledone* species other than *E. palari*, the nature of the modification involves the presence of a series of papillae or flattened plates on the sucker-bearing surface. In *E. palari* the modified portion appears as pads of thickened spongy tissue without papillae or plates. The degree of modification is more pronounced in *E. palari*. In all other *Eledone* species the modified portion comprises less than 2% of the total arm length, while in *E. palari* the modified portion may reach as high as 43%, and rarely less than 10% of arm length. These measurements undoubtedly are affected by preservation, hence the wide range of variation in the proportions of arm modification (see Table 4). However the differences in the extent of modification between *E. palari* and other species of *Eledone* are real and obvious.

*E. palari* is not a typical representative of the *Eledone* genus. It shares with other *Eledone* species the generic characters of having a single row of suckers on the arms, a "normal" radula, a well developed crop diverticulum, a deeply imbedded ink sac, a W- or VV-shaped funnel organ, and the heteromorphic male arm tips (Robson, 1932; Palacio, 1978). However, it differs from other *Eledone* species in having a hectocotylus which is well differentiated into a ligula and calamus. Hectocotyli of other *Eledone* species are not so differentiated, possessing a ligula but never a calamus.

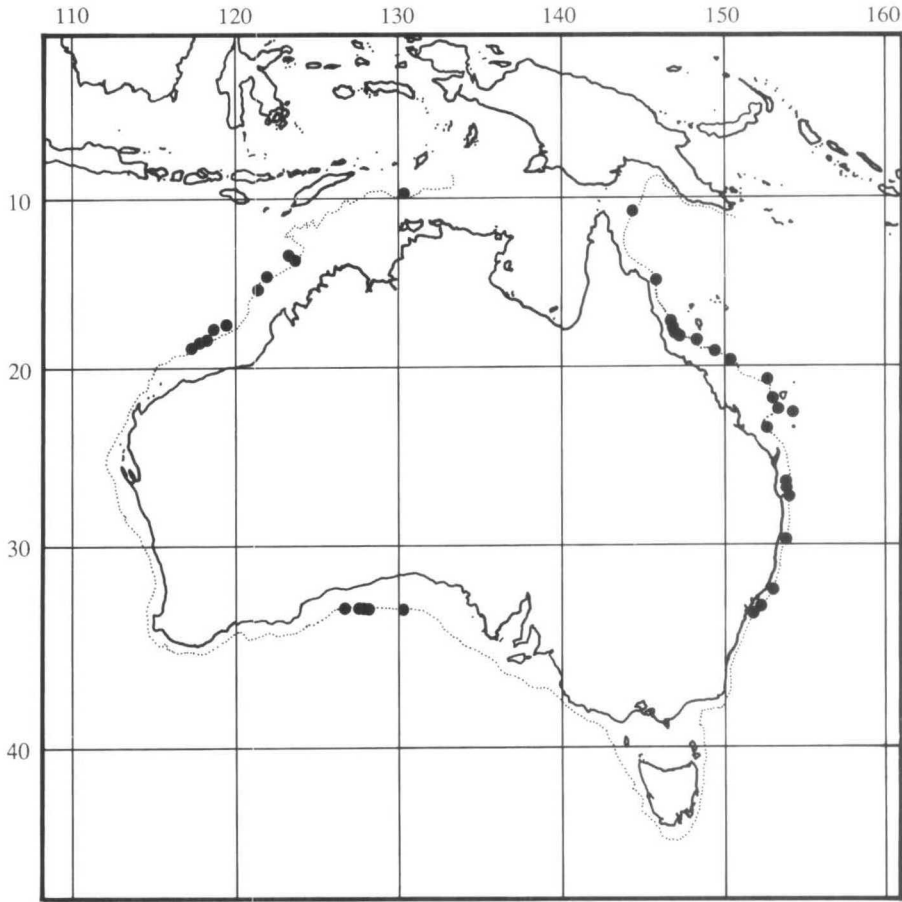


Figure 6. Geographical distribution of *Eledone palari* n. sp. around the coast of Australia.

The discovery of *E. palari* makes it necessary to redefine the genus *Eledone* as having a single row of arm suckers, "normal" radula, well developed crop diverticulum, deeply embedded and functional ink sac, W- or VV-shaped funnel organ, differentiated or undifferentiated calamus in males, and heteromorphic arm tips in males.

*E. palari* is the only species of *Eledone* found outside the Atlantic Ocean to date. Of the remaining seven congeners, *E. massyae* and *E. gaucha* occur in the south-western Atlantic from the coasts of Brazil and Argentina, and the other species are found in the eastern Atlantic from Iceland through to South Africa. The geographic isolation of *E. palari* in the Indian and Pacific waters around Australia, very distant from the Atlantic Ocean, could account for the differences in morphology between *E. palari* and its Atlantic congeners.

*E. palari* is found around the Australian coast in lower continental shelf to mid-continental slope waters, on the bottom at depths from 110–620 m. There are several discontinuities in the circum-Australian distribution. On the coast of northern Australia the species is not known to occur. There the continental shelf is very wide and shallow, and together with the probably higher water temperatures at the bottom in this area, could serve as a barrier to east-west distribution through

the Arafura Sea, Gulf of Carpentaria and Torres Strait. The other discontinuities in distribution, on the south-western and south-eastern Australian coasts, are most likely explained by the lack of collection effort.

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#### LITERATURE CITED

- Adam, W. 1950. Notes sur les Céphalopodes. 22. Deux nouvelles espèces de la cote africaine occidentale. *Bull. Inst. R. Sci. Nat. Belg.* 26(45): 1-9.
- Haimovici, M. 1988. *Eledone gaucha*, a new species of eledonid octopod (Cephalopoda: Octopodidae) from southern Brazil. *Nautilus* 102(2): 82-87.
- Hoyle, W. E. 1910. Mollusca: Cephalopoda. Pages 261-268, pl. 5a in L. S. Schultze. *Zoologische und anthropologische Ergebnisse einer Forschungsreise im westlichen und zentralen Südafrika ausgeführt in den Jahren 1903-1905*. 4(1). Gustav Fischer, Jena.
- Lamarck, J. B. 1798. Extrait d'un mémoire sur le genre de la Sèche, du Calmar et du Poulpe, vulgairement nommes. *Bull. Soc. Philomath. Paris* 2: 129-131.
- Leach, W. E. 1817. Synopsis of the orders, families, and genera of the Class Cephalopoda. Pages 137-141 in *The zoological miscellany; being descriptions of new or interesting animals* 3. Nodder, London.
- Lu, C. C. and J. U. Phillips. 1985. An annotated checklist of the Cephalopoda from Australian waters. *Occ. Pap. Mus. Vict.* 2: 21-36.
- Palacio, F. J. 1978. *Vosseledone charrua*: a new Patagonian cephalopod (Octopodidae) with notes on related genera. *Bull. Mar. Sci.* 28: 282-296.
- Robson, G. C. 1932. A monograph of the recent Cephalopoda. Part 2. The Octopoda (excluding the Octopodinae). British Museum (Natural History), London. xi + 359 pp., 6 pls.
- Roper, C. F. E. and G. L. Voss. 1983. Guidelines for taxonomic descriptions of cephalopod species. *Mem. Natn. Mus. Vict.* 44: 49-63.
- Voss, G. L. 1962. South African cephalopods. *Trans. R. Soc. S. Afr.* 36(4): 245-272, pl. 16.
- . 1964. A note on some cephalopods from Brazil with a description of a new species of octopod, *Eledone massyae*. *Bull. Mar. Sci. Gulf Carrib.* 14(3): 511-516.

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Appendix Table 1. Materials examined: *Eledone palari*, n. sp.

Type	Sex	ML (mm)	Reg. No.	Locality	Date	Depth (m)	Collector
Holotype	1M	38.3	NMV F57849	27°35'S, 153°50'E	2-VII-1981	157	FV IRON HUMPHREY
Paratypes	3M	30.8-39.0	AM C131854	11°35'S, 144°02'E	12-II-1979	275	Aust. Mus. Party
	7M, 8F	32.1-50.1	NMV F57531	27°35'S, 153°50'E	2-VII-1981	157	FV IRON HUMPHREY
	1M, 1F	34.0-35.9	WAM 12-90	27°35'S, 153°50'E	2-VII-1981	157	FV IRON HUMPHREY
	1M	37.9	NMV F57536	32°24'S, 152°56'E	30-I-1982	244-246	FRV SOELA
	1M, 1F	38.4-39.3	QM MO. 23564	27°35'S, 153°50'E	2-VII-1981	157	FV IRON HUMPHREY
	1M, 1F	39.7-40.5	SAM D18721	27°35'S, 153°50'E	2-VII-1981	157	FV IRON HUMPHREY
	1F	54.2	NMV F57537	19°38'S, 150°33'E	XI-1985	312	FRV SOELA
	1F	60.5	NMV F57850	33°40'S, 151°50'E	25-I-1982	204-210	FRV SOELA

Appendix Table 2. Other material of *Eledone palari* n. sp. examined

Sex	ML (mm)	Reg. No.	Locality	Date	Depth (m)	Collector
(eggs)	—	NMV F57828	27°02'S, 153°35'E	26-VI-1983	124–157	FV HARVEST MOON
1M	20.5	NMV F57532	33°21'S, 130°06'E	7-II-1979	200	FV COURAGEOUS
1M, 1F	30.0–39.8	NMV F57542	17°46'S, 146°56'E	30-XI-1985	348	FRV SOELA
1M, 1F	32.8–68.3	NMV F57535	18°00'S, 147°01'E	9-I-1986	224	FRV SOELA
1M	34.4	AM C71017	26°49'S, 153°35'E	27-VII-1968	137	Qld. Fish. Res. Inst.
1M	37.4	AM C131860	11°35'S, 144°01'E	12-II-1979	250	Aust. Mus. Party
1M	39.6	AM C140398	33°50'S, 151°45'E	17-XI-1976	256	FRV KAPALA
1M	39.9	AM C140401	33°39'S, 151°53'E	14-X-1976	274	FRV KAPALA
2F	40.1–43.7	NMV F57530	26°45'S, 153°40'E	11-VIII-1981	165–194	FV DEBBIE-MAREE
1F	40.2	NMV F57538	17°48'S, 146°55'E	30-XI-1985	296	FRV SOELA
3F	42.8–66.2	NMV F57534	18°00'S, 147°02'E	8-I-1986	220–222	FRV SOELA
1F	45.5	AM C140400	33°45'S, 151°39'E	5-XI-1978	143	FRV KAPALA
2M	45.6–48.8	NMV F57852	27°00'S, 153°45'E	26-II-1983	110–146	FV HARVEST MOON
1F	47.4	NMV F57851	33°42'S, 151°55'E	25-I-1982	560–620	FRV SOELA
1F	48.1	NMV F57539	17°55'S, 147°05'E	29-XI-1985	340–348	FRV SOELA
1M	49.0	NMV F57529	27°02'S, 153°35'E	III-1983	117	Qld. Fish. Serv.
1F	49.3	AM C71026	26°27'S, 153°50'E	5-VIII-1986	262–273	Qld. Fish. Res. Inst.
1F	53.4	AM C131853	18°03'S, 147°10'E	27-II-1979	320–358	Aust. Mus. Party
1F	57.0	NMV F57540	22°12'S, 153°31'E	19-XI-1985	325–344	FRV SOELA
1F	58.0	NMV F57541	19°00'S, 149°29'E	26-XI-1985	452–453	FRV SOELA
1F	60.3	AM C140399	33°46'S, 151°47'E	5-XII-1978	281	FRV KAPALA
1F	67.0	WAM 352-86	17°49'S, 118°41'E	21-VIII-1983	308–310	FV COURAGEOUS
1F	76.2	AM C89587	33°48'S, 151°44'E	26-IX-1972	229	FRV KAPALA
1F	80.0	NMV F57543	15°11'S, 121°27'E	17-II-1984	258	FRV SOELA
1F	80.3	NMV F57533	14°49'S, 121°55'E	17-II-1984	260	FRV SOELA